

CLAIMS:

1. A method for polishing a polishing target, wherein the polishing target has an insulation layer, a barrier layer, and a conductor layer, wherein the insulation layer has a surface, which includes a trench, wherein the barrier layer is located on the insulation layer, wherein the conductor layer is made of metal that includes copper and is located on the barrier layer, and wherein each of the barrier layer and the conductor layer has an inner portion located inside the trench and an outer portion located outside the trench, the method comprising:

polishing the polishing target using a first polishing composition to remove part of the outer portion of the conductor layer; wherein the first polishing composition includes abrasive, a polishing accelerator, hydrogen peroxide, and water; wherein the abrasive includes at least one of silicon dioxide and aluminum oxide; and wherein the polishing accelerator includes at least one of glycine and α -alanine;

polishing the polishing target using a second polishing composition to remove a remaining part of the outer portion of the conductor layer; and

polishing the polishing target using a third polishing composition to remove the outer portion of the barrier layer.

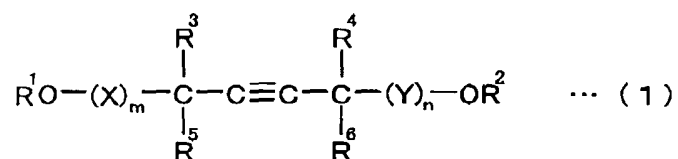
25

2. A method for polishing a polishing target, wherein the polishing target has an insulation layer, a barrier layer, and a conductor layer; wherein the insulation layer has a surface, which includes a trench; wherein the barrier layer is located on the insulation layer; wherein the conductor layer is made of metal that includes copper and is located on the barrier layer; and wherein each of the barrier layer and the conductor layer has an inner portion located inside the trench and an outer portion located outside the trench, the method comprising:

35

polishing the polishing target with a first polishing composition to remove part of the outer portion of the conductor layer;

5 polishing the polishing target with a second polishing composition to remove a remaining part of the outside portion of the conductor layer; wherein the second polishing composition includes abrasive, a polishing accelerator, an organic compound, a corrosion inhibitor, hydrogen peroxide, and water; wherein the abrasive includes at least one of
10 silicon dioxide and aluminum oxide; wherein the polishing accelerator includes at least one of glycine and α -alanine; and wherein the organic compound includes at least one compound selected from the group consisting of polyethylene oxide, polypropylene oxide, polyoxyethylene alkyl ether,
15 polyoxypropylene alkyl ether, polyoxyethylene polyoxypropylene alkyl ether, and an addition polymer of polyoxyalkylene represented by the following chemical formula (1),



wherein each of R^1 to R^6 represents a hydrogen atom or an
20 alkyl group the carbon number of which is any of integer numbers 1 to 10, wherein each of X and Y represents an ethyleneoxy group or a propyleneoxy group, wherein each of m and n represents any of integer numbers 1 to 20, and wherein the corrosion inhibitor includes at least one of benzotriazole
25 and a derivative of benzotriazole; and

polishing the polishing target using a third polishing composition to remove the outer portion of the barrier layer.

3. The method according to claim 2, wherein the first
30 polishing composition includes abrasive, which includes at least one of silicon dioxide and aluminum oxide; a polishing accelerator, which includes at least one of glycine and α -

alanine; hydrogen peroxide; and water.

4. The method according to claim 2, wherein the third polishing composition includes abrasive, which includes at least one of silicon dioxide and aluminum oxide; acid or alkali, a corrosion inhibitor, which includes at least one of benzotriazole and a derivative of benzotriazole, and water, wherein the acid includes at least one acid selected from the group consisting of nitric acid, hydrochloric acid, lactic acid, phosphoric acid, sulfuric acid, acetic acid, oxalic acid, citric acid, tartaric acid, malonic acid, succinic acid, maleic acid, and fumaric acid, and wherein the alkali includes at least one alkali selected from the group consisting of potassium hydroxide, ammonium hydroxide, and sodium hydroxide.

5. A method for polishing a polishing target; wherein the polishing target has an insulation layer, a barrier layer, and a conductor layer; wherein the insulation layer has a surface, which includes a trench; wherein the barrier layer is located on the insulation layer; wherein the conductor layer is made of metal that includes copper and is located on the barrier layer; and wherein each of the barrier layer and the conductor layer has an inner portion located inside the trench and an outer portion located outside the trench, the method comprising:

polishing the polishing target using a first polishing composition to remove part of the outer portion of the conductor layer;

polishing the polishing target using a second polishing composition to remove a remaining part of the outer portion of the conductor layer; and

polishing the polishing target using a third polishing composition to remove the outer portion of the barrier layer; wherein the third polishing composition includes abrasive, acid or alkali, a corrosion inhibitor, and water; wherein the

abrasive includes at least one of silicon dioxide and aluminum oxide; wherein the acid includes at least one acid selected from the group consisting of nitric acid, hydrochloric acid, lactic acid, phosphoric acid, sulfuric acid, acetic acid, oxalic acid, citric acid, tartaric acid, malonic acid, succinic acid, maleic acid, and fumaric acid; wherein the alkali includes at least one alkali selected from the group consisting of potassium hydroxide, ammonium hydroxide, and sodium hydroxide; and wherein the corrosion inhibitor includes at least one of benzotriazole and a derivative of benzotriazole.

6. The method according to claim 5, wherein the first polishing composition includes abrasive, which includes at least one of silicon dioxide and aluminum oxide; a polishing accelerator; hydrogen peroxide; and water; and wherein the polishing accelerator includes at least one of glycine and α -alanine.

7. A method for polishing a polishing target, wherein the polishing target has an insulation layer, a barrier layer, and a conductor layer; wherein the insulation layer has a surface, which includes a trench; wherein the barrier layer is located on the insulation layer; wherein the conductor layer is made of metal that includes copper and is located on the barrier layer; and wherein each of the barrier layer and the conductor layer has an inner portion located inside the trench and an outer portion located outside the trench, the method comprising:

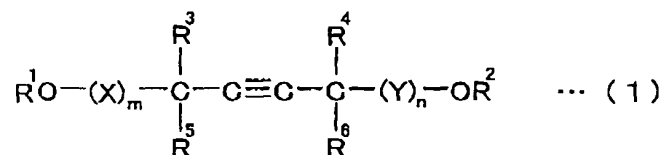
polishing the polishing target using a first polishing composition to remove part of the outer portion of the conductor layer; wherein the first polishing composition includes abrasive, a polishing accelerator, hydrogen peroxide, and water;

polishing the polishing target using a second polishing

composition to remove a remaining part of the outer portion of the conductor layer; wherein the second polishing composition includes abrasive, a polishing accelerator, an organic compound, a corrosion inhibitor, hydrogen peroxide, and water;
5 and

polishing the polishing target using a third polishing composition to remove the outer portion of the barrier layer; wherein the third polishing composition includes abrasive, acid or alkali, a corrosion inhibitor, and water;

10 wherein each abrasive includes at least one of silicon dioxide and aluminum oxide; wherein each polishing accelerator includes at least one of glycine and α -alanine; wherein the organic compound includes at least one compound selected from the group consisting of polyethylene oxide, polypropylene
15 oxide, polyoxyethylene alkyl ether, polyoxypropylene alkyl ether, polyoxyethylene polyoxypropylene alkyl ether, and an addition polymer of polyoxyalkylene represented by the following chemical formula (1), and



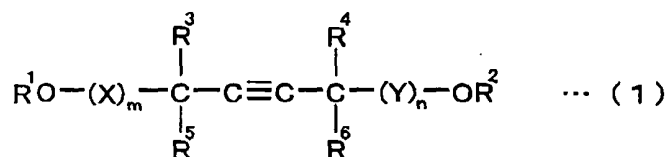
20 wherein each of R^1 to R^6 represents a hydrogen atom or an alkyl group the carbon number of which is any of integer numbers 1 to 10; wherein each of X and Y represents an ethyleneoxy group or a propyleneoxy group, wherein each of m and n represents any of integer numbers 1 to 20; wherein the
25 acid includes at least one acid selected from the group consisting of nitric acid, hydrochloric acid, lactic acid, phosphoric acid, sulfuric acid, acetic acid, oxalic acid, citric acid, tartaric acid, malonic acid, succinic acid, maleic acid, and fumaric acid; wherein the alkali includes at
30 least one alkali selected from the group consisting of potassium hydroxide, ammonium hydroxide, and sodium hydroxide; and wherein each corrosion inhibitor includes at least one of

benzotriazole and a derivative of benzotriazole.

8. The method according to claim 7, wherein the third polishing composition further includes a polishing accelerator, which includes at least one of glycine and α -alanine.

9. The method according to claim 8, wherein a main composition, a first sub-composition, and a second sub-composition are prepared before polishing the polishing target,

wherein the main composition includes abrasive, a polishing accelerator, and water; wherein the abrasive includes at least one of silicon dioxide and aluminum oxide; wherein the polishing accelerator includes glycine and α -alanine; wherein the first sub-composition includes an organic compound, a first corrosion inhibitor, and water; and wherein the organic compound includes at least one compound selected from the group consisting of polyethylene oxide, polypropylene oxide, polyoxyethylene alkyl ether, polyoxypropylene alkyl ether, polyoxyethylene polyoxypropylene alkyl ether, and an addition polymer of polyoxyalkylene represented by the following chemical formula (1),



wherein each of R^1 to R^6 represents a hydrogen atom or an alkyl group the carbon number of which is any of integer numbers 1 to 10 ; wherein each of X and Y represents an ethyleneoxy group or a propyleneoxy group; wherein each of m and n represents any of integer numbers 1 to 20; wherein the first corrosion inhibitor includes at least one of benzotriazole and a derivative of benzotriazole; wherein the second sub-composition includes acid or alkali, a second

corrosion inhibitor, and water; wherein the acid includes at least one acid selected from the group consisting of nitric acid, hydrochloric acid, lactic acid, phosphoric acid, sulfuric acid, acetic acid, oxalic acid, citric acid, tartaric acid, malonic acid, succinic acid, maleic acid, and fumaric acid; wherein the alkali includes at least one alkali selected from the group consisting of potassium hydroxide, ammonium hydroxide, and sodium hydroxide; and wherein the second corrosion inhibitor includes at least one of benzotriazole and a derivative of benzotriazole; and

wherein the first polishing composition is prepared by mixing the main composition and hydrogen peroxide when using the first polishing composition; wherein the second polishing composition is prepared by mixing the main composition, the first sub-composition, and hydrogen peroxide when using the second polishing composition; and wherein the third polishing composition is prepared by mixing the main composition and the second sub-composition when using the third polishing composition.

10. The method according to claim 7, wherein the third polishing composition further includes hydrogen peroxide.

11. A polishing composition used for polishing a polishing target; wherein the polishing target has an insulation layer, a barrier layer, and a conductor layer; wherein the insulation layer has a surface, which includes a trench; wherein the barrier layer is located on the insulation layer; wherein the conductor layer is made of metal that includes copper and is located on the barrier layer; and wherein each of the barrier layer and the conductor layer has an inner portion located inside the trench and an outer portion located outside the trench;

wherein the polishing composition is used to polish the polishing target to remove part of the outer portion of the

conductor layer; wherein the polishing composition includes abrasive, a polishing accelerator, hydrogen peroxide, and water; wherein the abrasive includes at least one of silicon dioxide and aluminum oxide; and wherein the polishing
5 accelerator includes at least one of glycine and α -alanine.

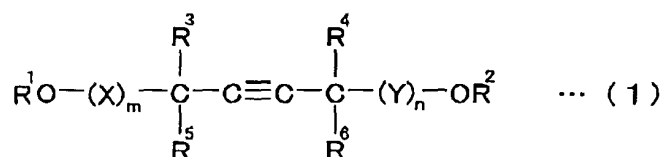
12. The polishing composition according to claim 11, wherein the polishing composition is prepared by mixing a mixture of the abrasive, the polishing accelerator, and the
10 water with the hydrogen peroxide when using the polishing composition.

13. The polishing composition according to claim 11, wherein the polishing composition is prepared by mixing a
15 mixture of the abrasive, the polishing accelerator, and part of the water with the hydrogen peroxide when using the polishing composition; and further diluting the polishing composition with remaining water.

20 14. A polishing composition used for polishing a polishing target; wherein the polishing target has an insulation layer, a barrier layer, and a conductor layer; wherein the insulation layer has a surface, which includes a trench; wherein the barrier layer is located on the insulation
25 layer; wherein the conductor layer is made of metal that includes copper and is located on the barrier layer; and wherein each of the barrier layer and the conductor layer has an inner portion located inside the trench and an outer portion located outside the trench,

30 wherein the polishing composition is used to polish the polishing target from which part of the outer portion of the conductor layer is removed by prepolishing to remove a remaining part of the outer portion of the conductor layer; wherein the polishing composition includes abrasive, a
35 polishing accelerator, a organic compound, a corrosion

inhibitor, hydrogen peroxide, and water; wherein the abrasive includes at least one of silicon dioxide and aluminum oxide; wherein the polishing accelerator includes at least one of glycine and α -alanine; and wherein the organic compound includes at least one compound selected from the group consisting of polyethylene oxide, polypropylene oxide, polyoxyethylene alkyl ether, polyoxypropylene alkyl ether, polyoxyethylene polyoxypropylene alkyl ether, and an addition polymer of polyoxyalkylene represented by the following chemical formula (1), and



wherein each of R^1 to R^6 represents a hydrogen atom or an alkyl group the carbon number of which is any of integer numbers 1 to 10; wherein each of X and Y represents an ethyleneoxy group or a propyleneoxy group; wherein each of m and n represents any of integer numbers 1 to 20; and wherein the corrosion inhibitor includes at least one of benzotriazole and a derivative of benzotriazole.

15. The polishing composition according to claim 14, wherein the polishing composition is prepared by mixing a first mixture, which includes the abrasive, the polishing accelerator, and part of the water; a second mixture, which includes the organic compound, the corrosion inhibitor, and a remaining part of the water; and the hydrogen peroxide when using the polishing composition.

16. The polishing composition according to claim 14, wherein the polishing composition is prepared by mixing a first mixture, which includes the abrasive, the polishing accelerator, and part of the water; a second mixture, which includes the organic compound, the corrosion inhibitor, and

another part of the water; and the hydrogen peroxide when using the polishing composition; and further diluting the polishing composition with a remaining part of the water.

5 17. A polishing composition used for polishing a polishing target; wherein the polishing target has an insulation layer, a barrier layer, and a conductor layer; wherein the insulation layer has a surface, which includes a trench; wherein the barrier layer is located on the insulation
10 layer; wherein the conductor layer is made of metal that includes copper and is located on the barrier layer; and wherein each of the barrier layer and the conductor layer has an inner portion located inside the trench and an outer portion located outside the trench,
15 wherein the polishing composition is used to polish the polishing target from which the outer portion of the conductor layer is removed by prepolishing to remove the outer portion of the barrier layer; wherein the polishing composition includes abrasive, acid or alkali, a corrosion inhibitor, and
20 water; wherein the abrasive includes at least one of silicon dioxide and aluminum oxide; wherein the acid includes at least one acid selected from the group consisting of nitric acid, hydrochloric acid, lactic acid, phosphoric acid, sulfuric acid, acetic acid, oxalic acid, citric acid, tartaric acid,
25 malonic acid, succinic acid, maleic acid, and fumaric acid; wherein the alkali includes at least one alkali selected from the group consisting of potassium hydroxide, ammonium hydroxide, and sodium hydroxide; and wherein the corrosion inhibitor includes at least one of benzotriazole and a
30 derivative of benzotriazole.

18. The polishing composition according to claim 17, further comprising a polishing accelerator, wherein the polishing accelerator includes at least one of glycine and α -
35 alanine.

19. The polishing composition according to claim 18,
wherein the polishing composition is prepared by mixing a
first mixture, which includes the abrasive, the polishing
5 accelerator, and part of the water; and a second mixture,
which includes the acid or alkali, the corrosion inhibitor,
and a remaining part of the water when using the polishing
composition.

10 20. The polishing composition according to claim 18,
wherein the polishing composition is prepared by mixing a
first mixture, which includes the abrasive, the polishing
accelerator, and part of the water; and a second mixture,
which includes the acid or alkali, the corrosion inhibitor,
15 and another part of the water when using the polishing
composition; and further diluting the polishing composition
with a remaining part of the water.

21. The polishing composition according to claim 17,
20 further comprising hydrogen peroxide.

22. The polishing composition according to claim 18,
further comprising hydrogen peroxide.

25 23. The polishing composition according to claim 22,
wherein the polishing composition is prepared by mixing a
first mixture, which includes the abrasive, the polishing
accelerator, and part of the water; a second mixture, which
includes the acid or alkali, the corrosion inhibitor, and a
30 remaining part of the water; and hydrogen peroxide when using
the polishing composition.

24. The polishing composition according to claim 22,
wherein the polishing composition is prepared by mixing a
35 first mixture, which includes the abrasive, the polishing

accelerator, and part of the water; a second mixture, which includes the acid or alkali, the corrosion inhibitor, and another part of the water; and hydrogen peroxide when using the polishing composition; and further diluting the polishing
5 composition with a remaining part of the water.